

COMPONENTS:	EVALUATOR:
(1) Methane; CH ₄ ; [74-82-8]	H. Lawrence Clever Chemistry Department Emory University Atlanta, GA 30322 USA
(2) Cycloalkanes Cyclohexane Methylcyclohexane Dimethylcyclohexanes Cyclooctane Bicyclohexyl	1984, January

CRITICAL EVALUATION:

The Solubility of Methane in Cycloalkanes at Partial Pressures up to 200 kPa (ca. 2 atm).

Values of the solubility of methane in cycloalkanes are reported in seven papers by various volumetric methods used at a total pressure of about one atmosphere. With the exception of the methane + cyclohexane system, there are not enough measurements on any one system to recommend solubility values. Most of the data are classed as tentative.

Methane + Cyclohexane; C₆H₁₂; [110-82-7]

Guerry (ref. 1), Lannung and Gjaldbaek (ref. 2), and Ben-Naim and Yaacobi (ref. 3) report solubility data on the system. Guerry's data are about 15 percent smaller than the data of the others and his data are classed as doubtful. The smoothed data of Lannung and Gjaldbaek and of Ben-Naim and Yaacobi agree within 0.30 percent between 288 and 303 K.

The combined sets of data were fitted by the method of least squares to obtain the equation

$$\ln x_1 = -6.74545 + 3.06826/(T/100 \text{ K})$$

with a standard error about the regression line of 2.0×10^{-5} . The temperature independent thermodynamic changes from the equation are

$$\Delta \bar{H}_1^\circ/\text{kJ mol}^{-1} = -2.55 \quad \text{and} \quad \Delta \bar{S}_1^\circ/\text{J K}^{-1} \text{ mol}^{-1} = -56.1$$

The smoothed solubility data and partial molal Gibbs energy of solution are in Table 1.

Table 1. Solubility of methane in cyclohexane. Recommended mole fraction solubility at 101.325 kPa (1 atm) partial pressure of methane and the partial molal Gibbs energy of solution as a function of temperature.

T/K	Mol Fraction $10^3 x_1$	$\Delta \bar{G}_1^\circ/\text{kJ mol}^{-1}$
283.15	3.47	13.329
293.15	3.35	13.890
298.15	3.29	14.170
303.15	3.24	14.451
313.15	3.13	15.012

Methane + Methylcyclohexane; C₇H₁₄; [108-87-2]

Only Field, Wilhelm and Battino (ref. 4) report solubility data on this system. These solubility values at three temperatures were treated by a linear regression to obtain the equation

$$\ln x_1 = -7.54994 + 6.01428/(T/100 \text{ K})$$

with a standard error about the regression line of 2.6×10^{-6} .

The temperature independent thermodynamic changes from the equation are

$$\Delta\bar{H}_1^\circ/\text{kJ mol}^{-1} = -5.00 \quad \text{and} \quad \Delta\bar{S}_1^\circ/\text{J K}^{-1} \text{ mol}^{-1} = -62.8$$

The smoothed solubility and partial molal Gibbs energy of solution values are in Table 2.

Table 2. Solubility of methane in methylcyclohexane. Tentative values of the mole fraction solubility at 101.325 kPa (1 atm) methane partial pressure and partial molal Gibbs energy of solution as a function of temperature.

T/K	Mol Fraction	$\Delta\bar{G}_1^\circ/\text{kJ mol}^{-1}$
	$10^3 x_1$	
283.15	4.40	12.774
293.15	4.09	13.401
298.15	3.96	13.715
303.15	3.83	14.029
313.15	3.59	14.657

Methane + *trans*-1,2-Dimethylcyclohexane; C₈H₁₆; [6876-23-9]

Methane + *cis*-1,2-Dimethylcyclohexane; C₈H₁₆; [2207-01-4]

Methane + *trans*-1,3-Dimethylcyclohexane; C₈H₁₆; [2207-03-6]

+ *cis*-1,3-Dimethylcyclohexane; C₈H₁₆; [638-04-0]

Methane + *trans*-1,4-Dimethylcyclohexane; C₈H₁₆; [2207-04-7]

+ *cis*-1,4-Dimethylcyclohexane; C₈H₁₆; [624-24-3]

The solubility data on the four systems were reported by Geller, Battino, and Wilhelm (ref. 5). Measurements were reported for only two temperatures, thus the partial molal enthalpy and entropy of solution are possibly less reliable than for systems with measurements at additional temperatures. The values of the thermodynamic changes on solution are

Thermo	<i>trans</i> -1,2-DMC	<i>cis</i> -1,2-DMC	<i>trans</i> -1,3-DMC/ <i>cis</i> -1,3-DMC 41/59 mol%	<i>trans</i> -1,4-DMC/ <i>cis</i> -1,4-DMC 30/70 mol%
changes				
$\Delta\bar{H}_1^\circ/\text{kJ mol}^{-1}$	-4.11	-4.54	-4.50	-5.86
$\Delta\bar{S}_1^\circ/\text{J K}^{-1} \text{ mol}^{-1}$	-59.1	-61.2	-60.5	-64.9

The data on each system were fitted by a linear regression to a two constant equation

$$\ln x_1 = A_1 + A_2/(T/100 \text{ K})$$

Values for A₁ and A₂ for each system are given below.

COMPONENTS: (1) Methane; CH ₄ ; [74-82-8] (2) Cycloalkanes Cyclohexane Methylcyclohexane Dimethylcyclohexanes Cyclooctane Bicyclohexyl	EVALUATOR: H. Lawrence Clever Chemistry Department Emory University Atlanta, GA 30322 USA 1984, January
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CRITICAL EVALUATION:

Constants	<i>trans</i> -1,2-DMC	<i>cis</i> -1,2-DMC	<i>trans</i> -1,3-DMC/ <i>cis</i> -1,3-DMC 41/59 mol%	<i>trans</i> -1,4-DMC/ <i>cis</i> -1,4-DMC 30/70 mol%
A ₁	-7.11257	-7.36300	-7.27244	-7.81023
A ₂	4.94415	5.45917	5.41233	7.04831

Smoothed values of the solubility are in Table 3.

Table 3. Solubility of methane in dimethylcyclohexanes. Tentative values of the mole fraction solubility at 101.325 kPa (1 atm) partial methane pressure as a function of temperature.

T/K	methane Mol Fraction, 10 ³ x ₁			
	<i>trans</i> -1,2-DMC	<i>cis</i> -1,2-DMC	<i>trans</i> -1,3-DMC/ <i>cis</i> -1,3-DMC 41/59 mol%	<i>trans</i> -1,4-DMC/ <i>cis</i> -1,4-DMC 30/70 mol%
298.15	4.28	3.96	4.27	4.31
303.15	4.16	3.84	4.14	4.15
313.15	3.95	3.63	3.91	3.85

Methane + Cyclooctane; C₈H₁₆; [296-64-8]

Wilcock, Battino and Wilhelm (ref. 6) report the solubility of methane in cyclooctane at three temperatures between 288.89 and 313.45 K. A linear regression of the data gives the equation

$$\ln x_1 = -7.43325 + 4.68345/(T/100 \text{ K})$$

with a standard error about the regression line of 9.8×10^{-5} .

The temperature independent thermodynamic changes on solution from the equation are

$$\Delta \bar{H}_1^\circ / \text{kJ mol}^{-1} = -3.89 \quad \text{and} \quad \Delta \bar{S}_1^\circ / \text{J K}^{-1} \text{ mol}^{-1} = -61.8$$

Smoothed values of the solubility and partial molal Gibbs energy of solution are in Table 4.

Table 4. Solubility of methane in cyclooctane. Tentative values of the mole fraction solubility at 101.325 kPa (1 atm) partial methane pressure and partial molal Gibbs energy of solution as a function of temperature.

T/K	Mol Fraction	$\Delta \bar{G}_1^\circ/\text{kJ mol}^{-1}$
	$10^3 x_1$	
293.15	2.92	14.223
298.15	2.84	14.532
303.15	2.77	14.841
313.15	2.64	15.459

Methane + Bicyclohexyl; $\text{C}_{12}\text{H}_{22}$; [92-51-3]

Cukor and Prausnitz (ref. 7) report eight values of the solubility of methane in bicyclohexyl at 25 degrees intervals between 300 and 475 K. The Henry's constants reported by the authors have been converted to mole fraction values at 101.325 kPa (1 atm) methane partial pressure and fitted by a linear regression to obtain the equation

$$\ln x_1 = -20.76150 + 25.20566/(T/100 \text{ K}) + 6.07641 \ln(T/100 \text{ K})$$

with a standard error about the regression line of 3.9×10^{-5} . The three constant equation gives thermodynamic changes in enthalpy and entropy that change with temperature. Values at several temperatures are below:

T/K	$\Delta \bar{H}_1^\circ / \text{kJ mol}^{-1}$	$\Delta \bar{S}_1^\circ / \text{J K}^{-1} \text{ mol}^{-1}$	$\Delta \bar{C}_p^\circ / \text{J K}^{-1} \text{ mol}^{-1}$
298.15	-5.89	-66.9	50.5
323.15	-4.63	-62.8	50.5
373.15	-2.10	-55.6	50.5
423.15	+0.42	-49.2	50.5
473.15	+2.95	-43.6	50.5

Smoothed values of the solubility and partial molal Gibbs energy are in Table 5. The minimum solubility occurs at 415 K.

Table 5. Solubility of methane in bicyclohexyl. Tentative values of the mole fraction solubility at 101.325 kPa (1 atm) methane partial pressure and partial molal Gibbs energy of solution as a function of temperature.

T/K	Mol Fraction	$\Delta \overline{G}_1^\circ / \text{kJ mol}^{-1}$
	$10^3 x_1$	
298.15	3.45	14.054
303.15	3.32	14.387
313.15	3.10	15.039
323.15	2.93	15.675
373.15	2.47	18.631
423.15	2.38	21.247
473.15	2.50	23.565

References

1. Guerry, D. Jr. Ph.D. thesis, 1944, Vanderbilt University, Nashville, TN.
2. Lannung, A.; Gjaldbaek, J. C. *Acta Chem. Scand.* 1960, *14*, 1124.
3. Ben-Naim, A.; Yaacobi, M. *J. Phys. Chem.* 1974, *14*, 1124.
4. Field, L. R.; Wilhelm, E.; Battino, R. *J. Chem. Thermodyn.* 1974, *6*, 237.
5. Geller, E. B.; Battino, R.; Wilhelm, E. *J. Chem. Thermodyn.* 1976, *8*, 197.
6. Wilcock, R. J.; Battino, R.; Wilhelm, E. *J. Chem. Thermodyn.* 1977, *9*, 111.
7. Cukor, P. M.; Prausnitz, J. M. *J. Phys. Chem.* 1972, *76*, 598.

COMPONENTS:		ORIGINAL MEASUREMENTS:	
(1) Methane; CH ₄ ; [74-82-8]		Lannung, A.; Gjaldbaek, J. C.	
(2) Cyclohexane; C ₆ H ₁₂ ; [110-82-7]		Acta Chem. Scand. 1960, 14, 1124 - 1128.	
VARIABLES:		PREPARED BY:	
T/K = 291.15 - 310.15 p ₁ /kPa = 101.325 (1 atm)		J. Chr. Gjaldbaek	
EXPERIMENTAL VALUES:			
T/K	Mol Fraction 10 ³ x ₁	Bunsen Coefficient α/cm ³ (STP) cm ⁻³ atm ⁻¹	Ostwald Coefficient L/cm ³ cm ⁻³
291.15	3.38	0.702	0.748
291.15	3.37	0.699	0.745
298.15	3.28	0.677	0.739
298.15	3.26	0.673	0.735
310.15	3.18	0.645	0.732
310.15	3.16	0.641	0.728
Smoothed Data: For use between 291.15 and 310.15 K.			
ln x ₁ = -6.6984 + 2.9232/(T/100 K)			
The standard error about the regression line is 1.78 x 10 ⁻⁵ .			
T/K	Mol Fraction 10 ³ x ₁		
298.15	3.29		
308.15	3.18		
AUXILIARY INFORMATION			
METHOD/APPARATUS/PROCEDURE:		SOURCE AND PURITY OF MATERIALS:	
A calibrated all-glass combined manometer and bulb containing degassed solvent and the gas was placed in an air thermostat and shaken until equilibrium (1).		(1) Methane. Generated from magnesium methyl iodide. Purified by fractional distillation. Specific gravity corresponds with mol wt 16.08.	
The absorbed volume of gas is calculated from the initial and final amounts, both saturated with solvent vapor. The amount of solvent is determined by the weight of displaced mercury.		(2) Cyclohexane. Poulenc Frères. Shaken with fuming sulfuric acid and washed with water. Dried and distilled over phosphorus pentoxide. M.p./°C = 6.3.	
The values are at 101.325 kPa (1 atm) pressure assuming Henry's law is obeyed.		ESTIMATED ERROR:	
		δ T/K = ± 0.05 δ x ₁ /x ₁ = ± 0.015	
		REFERENCES:	
		1. Lannung, A. J. Am. Chem. Soc. 1930, 52, 68.	

COMPONENTS:		ORIGINAL MEASUREMENTS:	
1. Methane; CH ₄ ; [74-82-8]		Ben-Naim, A.; Yaacobi, M.	
2. Cyclohexane; C ₆ H ₁₂ ; [110-82-7]		J. Phys. Chem., <u>1974</u> , 78 , 175-8	
VARIABLES:		PREPARED BY:	
Temperature		C.L. Young	
EXPERIMENTAL VALUES:			
T/K	Ostwald coefficient [*] , L	Mole fraction ⁺ at partial pressure of 101.3 kPa, x _{CH₄}	
283.15	0.7603	0.00348	
288.15	0.7520	0.00341	
293.15	0.7450	0.00334	
298.15	0.7395	0.00333	
303.15	0.7353	0.00322	
* Smoothed values obtained from the equation.			
kT ln L = 1,822.9 - 12,053 (T/K) + 0.01791 (T/K) ² cal mol ⁻¹ where k is in units of cal mol ⁻¹ K ⁻¹			
+ calculated by compiler assuming the ideal gas law for methane.			
AUXILIARY INFORMATION			
METHOD/APPARATUS/PROCEDURE:		SOURCE AND PURITY OF MATERIALS:	
The apparatus was similar to that described by Ben-Naim and Baer (1) and Wen and Hung (2). It consists of three main parts, a dissolution cell of 300 to 600 cm ³ capacity, a gas volume measuring column, and a manometer. The solvent is degassed in the dissolution cell, the gas is introduced and dissolved while the liquid is kept stirred by a magnetic stirrer immersed in the water bath. Dissolution of the gas results in the change in the height of a column of mercury which is measured by a cathetometer.		1. Matheson sample, purity 99.97 mol per cent.	
		2. AR grade.	
		ESTIMATED ERROR:	
		δT/K = ±0.1; δx _{CH₄} = ±2%	
		REFERENCES:	
		1. Ben-Naim, A.; Baer, S. Trans. Faraday Soc. <u>1963</u> , 59 , 2735.	
		2. Wen, W.-Y.; Hung, J.H. J. Phys. Chem. <u>1970</u> , 74 , 170.	

COMPONENTS: (1) Methane; CH ₄ ; [74-82-8] (2) Methylcyclohexane; C ₇ H ₁₄ ; [108-87-2]		ORIGINAL MEASUREMENTS: Field, L. R.; Wilhelm, E.; Battino, R. <i>J. Chem. Thermodyn.</i> <u>1974</u> , <i>6</i> , 237 - 243.	
VARIABLES: T/K: 284.28 - 313.28 P/kPa: 101.325 (1 atm)		PREPARED BY: H. L. Clever	
EXPERIMENTAL VALUES:			
T/K	Mol Fraction 10 ³ x ₁	Bunsen Coefficient α/cm ³ (STP) cm ⁻³ atm ⁻¹	Ostwald Coefficient L/cm ³ cm ⁻³
284.28	4.363	0.778	0.8095
298.16	3.957	0.694	0.7570
313.28	3.587	0.618	0.7086
The gas solubility values were adjusted to an oxygen partial pressure of 101.325 kPa (1 atm) by Henry's law.			
The Bunsen coefficients were calculated by the compiler.			
Smoothed Data: For use between 283.15 and 313.28 K.			
$\ln x_1 = -7.5499 + 6.0143/(T/100 \text{ K})$			
The standard error about the regression line is 2.64 x 10 ⁻⁶ .			
T/K	Mol Fraction 10 ³ x ₁		
283.15	4.401		
293.15	4.094		
298.15	3.955		
303.15	3.826		
313.15	3.591		
AUXILIARY INFORMATION			
METHOD/APPARATUS/PROCEDURE: The solubility apparatus is based on the design of Morrison and Billett (1) and the version used is described by Battino, Evans, and Danforth (2). The degassing apparatus is that described by Battino, Banzhof, Bogan, and Wilhelm (3). Degassing. Up to 500 cm ³ of solvent is placed in a flask of such size that the liquid is about 4 cm deep. The liquid is rapidly stirred, and vacuum is intermittently applied through a liquid N ₂ trap until the permanent gas residual pressure drops to 5 microns. Solubility Determination. The degassed solvent is passed in a thin film down a glass spiral tube containing solute gas plus the solvent vapor at a total pressure of one atm. The volume of gas absorbed is found by difference between the initial and final volumes in the buret system. The solvent is collected in a tared flask and weighed.		SOURCE AND PURITY OF MATERIALS: (1) Methane. Either Matheson Co., Inc. or Air Products and Chemicals, Inc. Purest grade available, minimum purity greater than 99 mole per cent. (2) Methylcyclohexane. Phillips Petroleum Co. Pure Grade. Distilled.	
		ESTIMATED ERROR: $\delta T/\text{K} = 0.03$ $\delta P/\text{mmHg} = 0.5$ $\delta x_1/x_1 = 0.005$	
		REFERENCES: 1. Morrison, T. J.; Billett, F. <i>J. Chem. Soc.</i> <u>1948</u> , 2033. 2. Battino, R.; Evans, F. D.; Danforth, W. F. <i>J. Am. Oil Chem. Soc.</i> <u>1968</u> , <i>45</i> , 830. 3. Battino, R.; Banzhof, M.; Bogan, M.; Wilhelm, E. <i>Anal. Chem.</i> <u>1971</u> , <i>43</i> , 806.	

COMPONENTS:		ORIGINAL MEASUREMENTS:	
(1) Methane; CH ₄ ; [74-82-8]		Geller, E. B.; Battino, R. Wilhelm, E.	
(2) <i>cis</i> -1,2-Dimethylcyclohexane; C ₈ H ₁₆ ; [2207-01-4]		<i>J. Chem. Thermodyn.</i> <u>1976</u> , <i>8</i> , 197-202.	
VARIABLES:		PREPARED BY:	
<i>T</i> /K: 297.95, 312.99 <i>p</i> /kPa: 101.325 (1 atm)		H. L. Clever	
EXPERIMENTAL VALUES:			
<i>T</i> /K	Mol Fraction 10 ³ <i>x</i> ₁	Bunsen Coefficient α/cm ³ (STP) cm ⁻³ atm ⁻¹	Ostwald Coefficient L/cm ³ cm ⁻³
297.95	3.963	0.6297	0.6869
312.99	3.629	0.5678	0.6506
The Bunsen coefficients were calculated by the compiler assuming ideal gas behavior.			
The solubility values were adjusted to a methane partial pressure of 101.325 kPa by Henry's law.			
Smoothed Data: The equation is based on only two pair of experimental points and should be used with caution.			
For use between 297.95 and 312.99 K			
ln <i>x</i> ₁ = -7.3720 + 5.4868/(<i>T</i> /100K)			
<i>T</i> /K	Mol Fraction 10 ³ <i>x</i> ₁		
298.15	3.959		
308.15	3.730		
AUXILIARY INFORMATION			
METHOD/APPARATUS/PROCEDURE:		SOURCE AND PURITY OF MATERIALS:	
The solubility apparatus is based on the design of Morrison and Billett (1) and the version used is described by Battino, Evans, and Danforth (2). The degassing apparatus is that described by Battino, Banzhof, Bogan, and Wilhelm (3).		(1) Methane. Matheson Co., Inc. Stated to be 99.97 mole percent.	
Degassing. Up to 500 cm ³ of solvent is placed in a flask of such size that the liquid is about 4 cm deep. The liquid is rapidly stirred, and vacuum is intermittently applied through a liquid N ₂ trap until the permanent gas residual pressure drops to 5 microns.		(2) <i>cis</i> -1,2-Dimethylcyclohexane. Chemical Samples Co. Fractionally distilled and stored in dark. Refractive index (NaD, 298.15 K) 1.4337.	
Solubility Determination. The degassed solvent is passed in a thin film down a glass helical tube containing solute gas plus the solvent vapor at a total pressure of one atm. The volume of gas absorbed is found by differences between the initial and final volumes in the buret system. The solvent is collected in a tared flask and weighed.		ESTIMATED ERROR:	
		δ <i>T</i> /K = 0.03 δ <i>P</i> /mmHg = 0.5 δ <i>x</i> ₁ / <i>x</i> ₁ = 0.005	
		REFERENCES:	
		1. Morrison, T. J.; Billett, F. <i>J. Chem. Soc.</i> <u>1948</u> , 2033.	
		2. Battino, R.; Evans, F. D.; Danforth, W. F. <i>Chem. Soc.</i> <u>1968</u> , <i>45</i> , 830.	
		3. Battino, R.; Banzhof, M.; Bogan, M.; Wilhelm, E. <i>Anal. Chem.</i> <u>1971</u> , <i>43</i> , 806.	

COMPONENTS: (1) Methane; CH ₄ ; [74-82-8] (2) <i>trans</i> -1,2-Dimethylcyclohexane; C ₈ H ₁₆ ; [6876-23-9]		ORIGINAL MEASUREMENTS: Geller, E. B.; Battino, R. Wilhelm, E. <i>J. Chem. Thermodyn.</i> <u>1976</u> , <i>8</i> , 197-202.	
VARIABLES: <i>T</i> /K: 297.93 - 313.00 <i>p</i> /kPa: 101.325 (1 atm)		PREPARED BY: H. L. Clever	
EXPERIMENTAL VALUES:			
<i>T</i> /K	Mol Fraction 10 ³ <i>x</i> ₁	Bunsen Coefficient $\alpha/\text{cm}^3(\text{STP})\text{cm}^{-3}\text{atm}^{-1}$	Ostwald Coefficient <i>L</i> /cm ³ cm ⁻³
297.93	4.275	0.6622	0.7223
298.06	4.264	0.6604	0.7207
298.08	4.274	0.6610	0.7224
298.08	4.274	0.6619	0.7224
298.13	4.314	0.6681	0.7292
313.00	3.954	0.6031	0.6911
The Bunsen coefficients were calculated by the compiler assuming ideal gas behavior.			
The solubility values were adjusted to a methane partial pressure of 101.325 kPa by Henry's law.			
Smoothed Data: For use between 297.93 and 313.00 K $\ln x_1 = -7.1244 + 4.9808/(T/100\text{K})$			
<i>T</i> /K	Mol Fraction 10 ³ <i>x</i> ₁		
298.15	4.280		
308.15	4.054		
AUXILIARY INFORMATION			
METHOD/APPARATUS/PROCEDURE: The solubility apparatus is based on the design of Morrison and Billett (1) and the version used is described by Battino, Evans, and Danforth (2). The degassing apparatus is that described by Battino, Banzhof, Bogan, and Wilhelm (3). Degassing. Up to 500 cm ³ of solvent is placed in a flask of such size that the liquid is about 4 cm deep. The liquid is rapidly stirred, and vacuum is intermittently applied through a liquid N ₂ trap until the permanent gas residual pressure drops to 5 microns. Solubility Determination. The degassed solvent is passed in a thin film down a glass helical tube containing solute gas plus the solvent vapor at a total pressure of one atm. The volume of gas absorbed is found by differences between the initial and final volumes in the buret system. The solvent is collected in a tared flask and weighed.		SOURCE AND PURITY OF MATERIALS: (1) Methane. Matheson Co., Inc. Stated to be 99.97 mole percent. (2) <i>trans</i> -1,2-Dimethylcyclohexane. Chemical Samples Co. Fractionally distilled and stored in dark. Refractive index (NaD, 298.15 K) 1.4248. ESTIMATED ERROR: $\delta T/\text{K} = 0.03$ $\delta P/\text{mmHg} = 0.5$ $\delta x_1/x_1 = 0.005$	
		REFERENCES: 1. Morrison, T. J.; Billett, F. <i>J. Chem. Soc.</i> <u>1948</u> , 2033. 2. Battino, R.; Evans, F. D.; Danforth, W. F. <i>J. Am. Oil Chem. Soc.</i> <u>1968</u> , <i>45</i> , 830. 3. Battino, R.; Banzhof, M.; Bogan, M.; Wilhelm, E. <i>Anal. Chem.</i> <u>1971</u> , <i>43</i> , 806.	

COMPONENTS: (1) Methane; CH ₄ ; [74-82-8] (2) <i>trans</i> -1,4-Dimethylcyclohexane, 30 mol %; C ₈ H ₁₆ ; [2207-04-7] (3) <i>cis</i> -1,4-Dimethylcyclohexane, 70 mol %; C ₈ H ₁₆ ; [624-24-3]	ORIGINAL MEASUREMENTS: Geller, E. B.; Battino, R. Wilhelm, E. <i>J. Chem. Thermodyn.</i> <u>1976</u> , <i>8</i> , 197-202.												
VARIABLES: <i>T</i> /K: 298.08, 313.11 <i>p</i> /kPa: 101.325 (1 atm)	PREPARED BY: H. L. Clever												
EXPERIMENTAL VALUES: <table><tr><th><i>T</i>/K</th><th>Mol Fraction 10³<i>x</i>₁</th><th>Bunsen Coefficient α/cm³ (STP) cm⁻³ atm⁻¹</th><th>Ostwald Coefficient L/cm³ cm⁻³</th></tr><tr><td>298.08</td><td>4.315</td><td>0.6686</td><td>0.7296</td></tr><tr><td>313.11</td><td>3.852</td><td>0.5873</td><td>0.6732</td></tr></table> <p>The Bunsen coefficients were calculated by the compiler assuming ideal gas behavior.</p> <p>The solubility values were adjusted to a methane partial pressure of 101.325 kPa (1 atm) by Henry's law.</p>		<i>T</i> /K	Mol Fraction 10 ³ <i>x</i> ₁	Bunsen Coefficient α/cm ³ (STP) cm ⁻³ atm ⁻¹	Ostwald Coefficient L/cm ³ cm ⁻³	298.08	4.315	0.6686	0.7296	313.11	3.852	0.5873	0.6732
<i>T</i> /K	Mol Fraction 10 ³ <i>x</i> ₁	Bunsen Coefficient α/cm ³ (STP) cm ⁻³ atm ⁻¹	Ostwald Coefficient L/cm ³ cm ⁻³										
298.08	4.315	0.6686	0.7296										
313.11	3.852	0.5873	0.6732										
AUXILIARY INFORMATION													
METHOD/APPARATUS/PROCEDURE: <p>The solubility apparatus is based on the design of Morrison and Billett (1) and the version used is described by Battino, Evans, and Danforth (2). The degassing apparatus is that described by Battino, Banzhof, Bogan, and Wilhelm (3).</p> <p>Degassing. Up to 500 cm³ of solvent is placed in a flask of such size that the liquid is about 4 cm deep. The liquid is rapidly stirred, and vacuum is intermittently applied through a liquid N₂ trap until the permanent gas residual pressure drops to 5 microns.</p> <p>Solubility Determination. The degassed solvent is passed in a thin film down a glass helical tube containing solute gas plus the solvent vapor at a total pressure of one atm. The volume of gas absorbed is found by differences between the initial and final volumes in the buret system. The solvent is collected in a tared flask and weighed.</p>	SOURCE AND PURITY OF MATERIALS: <p>(1) Methane. Matheson Co., Inc. Stated to be 99.97 mole percent.</p> <p>(2) <i>trans</i>-1,4-Dimethylcyclohexane.</p> <p>(3) <i>cis</i>-1,4-Dimethylcyclohexane. Chemical Samples Co. The binary mixture used as received. Composition determined by refractive index by authors.</p> ESTIMATED ERROR: <p>$\delta T/K = 0.03$ $\delta P/\text{mmHg} = 0.5$ $\delta x_1/x_1 = 0.005$</p> REFERENCES: <p>1. Morrison, T. J.; Billett, F. <i>J. Chem. Soc.</i> <u>1948</u>, 2033. 2. Battino, R.; Evans, F. D.; Danforth, W. F. <i>J. Am. Oil Chem. Soc.</i> <u>1968</u>, <i>45</i>, 830. 3. Battino, R.; Banzhof, M.; Bogan, M.; Wilhelm, E. <i>Anal. Chem.</i> <u>1971</u>, <i>43</i>, 806.</p>												

COMPONENTS: (1) Methane; CH ₄ ; [74-82-8] (2) <i>trans</i> -1,3-Dimethylcyclohexane, 41 mol %; C ₈ H ₁₆ ; [2207-03-6] (3) <i>cis</i> -1,3-Dimethylcyclohexane, 59 mol %; C ₈ H ₁₆ ; [638-04-0]	ORIGINAL MEASUREMENTS: Geller, E. B.; Battino, R. Wilhelm, E. <i>J. Chem. Thermodyn.</i> <u>1976</u> , <i>8</i> , 197-202.												
VARIABLES: <i>T</i> /K: 298.41, 313.08 <i>p</i> /kPa: 101.325 (1 atm)	PREPARED BY: H. L. Clever												
EXPERIMENTAL VALUES: <table><tr><th><i>T</i>/K</th><th>Mol Fraction 10³<i>x</i>₁</th><th>Bunsen Coefficient $\alpha/\text{cm}^3 \text{ (STP) cm}^{-3} \text{ atm}^{-1}$</th><th>Ostwald Coefficient $L/\text{cm}^3 \text{ cm}^{-3}$</th></tr><tr><td>298.41</td><td>4.259</td><td>0.6572</td><td>0.7180</td></tr><tr><td>313.08</td><td>3.912</td><td>0.5945</td><td>0.6814</td></tr></table> <p>The Bunsen coefficients were calculated by the compiler assuming ideal gas behavior.</p> <p>The solubility values were adjusted to a methane partial pressure of 101.325 kPa (1 atm) by Henry's law.</p>		<i>T</i> /K	Mol Fraction 10 ³ <i>x</i> ₁	Bunsen Coefficient $\alpha/\text{cm}^3 \text{ (STP) cm}^{-3} \text{ atm}^{-1}$	Ostwald Coefficient $L/\text{cm}^3 \text{ cm}^{-3}$	298.41	4.259	0.6572	0.7180	313.08	3.912	0.5945	0.6814
<i>T</i> /K	Mol Fraction 10 ³ <i>x</i> ₁	Bunsen Coefficient $\alpha/\text{cm}^3 \text{ (STP) cm}^{-3} \text{ atm}^{-1}$	Ostwald Coefficient $L/\text{cm}^3 \text{ cm}^{-3}$										
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COMPONENTS: (1) Methane; CH ₄ ; [74-82-8] (2) Cyclooctane; C ₈ H ₁₆ ; [292-64-8]		ORIGINAL MEASUREMENTS: Wilcock, R. J.; Battino, R.; Wilhelm, E. <i>J. Chem. Thermodyn.</i> <u>1977</u> , 9, 111 - 115.																	
VARIABLES: T/K: 288.89 - 313.45 P/kPa: 101.325 (1 atm)		PREPARED BY: H. L. Clever																	
EXPERIMENTAL VALUES:																			
<table><tr><th>T/K</th><th>Mol Fraction 10³ x₁</th><th>Bunsen Coefficient α</th><th>Ostwald Coefficient L</th></tr><tr><td>288.89</td><td>3.042</td><td>0.5106</td><td>0.5400</td></tr><tr><td>298.21</td><td>2.765</td><td>0.4599</td><td>0.5021</td></tr><tr><td>313.45</td><td>2.664</td><td>0.4365</td><td>0.5009</td></tr></table>				T/K	Mol Fraction 10 ³ x ₁	Bunsen Coefficient α	Ostwald Coefficient L	288.89	3.042	0.5106	0.5400	298.21	2.765	0.4599	0.5021	313.45	2.664	0.4365	0.5009
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The Bunsen coefficients were calculated by the compiler.																			
The solubility values were adjusted to a methane partial pressure of 101.325 kPa by Henry's law.																			
Smoothed Data: For 288.15 to 313.15 K																			
$\ln x_1 = -7.4333 + 4.6835/(T/100K)$																			
The standard error about the regression line is 9.80 x 10 ⁻⁵ .																			
<table><tr><th>T/K</th><th>Mol Fraction 10³ x₁</th></tr><tr><td>288.15</td><td>3.00</td></tr><tr><td>298.15</td><td>2.84</td></tr><tr><td>308.15</td><td>2.70</td></tr></table>				T/K	Mol Fraction 10 ³ x ₁	288.15	3.00	298.15	2.84	308.15	2.70								
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METHOD/APPARATUS/PROCEDURE: The solubility apparatus is based on the design of Morrison and Billett (1) and the version used is described by Battino, Evans, and Danforth (2). The degassing apparatus is that described by Battino, Banzhof, Bogan, and Wilhelm (3). Degassing. Up to 500 cm ³ of solvent is placed in a flask of such size that the liquid is about 4 cm deep. The liquid is rapidly stirred, and vacuum is intermittently applied through a liquid N ₂ trap until the permanent gas residual pressure drops to 5 microns. Solubility Determination. The degassed solvent is passed in a thin film down a glass spiral tube containing solute gas plus the solvent vapor at a total pressure of one atm. The volume of gas absorbed is found by difference between the initial and final volumes in the buret system. The solvent is collected in a tared flask and weighed.		SOURCE AND PURITY OF MATERIALS: (1) Methane. Matheson Co., Inc. Minimum mole per cent purity is 99.97. (2) Cyclooctane. Chemical Samples Co. 99 mole per cent, distilled, refractive index (NaD, 298.15 K) 1.4562. ESTIMATED ERROR: δT/K = 0.03 δP/mmHg = 0.5 δx ₁ /x ₁ = 0.005 REFERENCES: 1. Morrison, T. J.; Billett, F. <i>J. Chem. Soc.</i> <u>1948</u> , 2033. 2. Battino, R.; Evans, F. D.; Danforth, W. F. <i>J. Am. Oil Chem. Soc.</i> <u>1968</u> , 45, 830. 3. Battino, R.; Banzhof, M.; Bogan, M.; Wilhelm, E. <i>Anal. Chem.</i> <u>1971</u> , 43, 806.																	

COMPONENTS: (1) Methane; CH ₄ ; [74-82-8] (2) Cyclic hydrocarbons; C ₆ H ₁₀ and C ₆ H ₁₂		ORIGINAL MEASUREMENTS: Guerry, D. Jr. Ph.D. thesis, 1944 Vanderbilt University Nashville, TN Thesis Director: L. J. Bircher																													
VARIABLES: T/K: 293.15, 298.15 P/kPa: 101.325 (1 atm)		PREPARED BY: H. L. Clever																													
EXPERIMENTAL VALUES:																															
<table><tr><td>T/K</td><td>Mol Fraction $x_1 \times 10^4$</td><td>Bunsen Coefficient α</td><td>Ostwald Coefficient L</td></tr><tr><td colspan="4">Cyclohexene; C₆H₁₀; [110-83-8]</td></tr><tr><td>293.15</td><td>24.8</td><td>0.551</td><td>0.591</td></tr><tr><td>298.15</td><td>24.6</td><td>0.543</td><td>0.593</td></tr><tr><td colspan="4">Cyclohexane; C₆H₁₂; [110-82-7]</td></tr><tr><td>293.15</td><td>29.2</td><td>0.607</td><td>0.651</td></tr><tr><td>298.15</td><td>28.3</td><td>0.585</td><td>0.639</td></tr></table>				T/K	Mol Fraction $x_1 \times 10^4$	Bunsen Coefficient α	Ostwald Coefficient L	Cyclohexene; C ₆ H ₁₀ ; [110-83-8]				293.15	24.8	0.551	0.591	298.15	24.6	0.543	0.593	Cyclohexane; C ₆ H ₁₂ ; [110-82-7]				293.15	29.2	0.607	0.651	298.15	28.3	0.585	0.639
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The Ostwald coefficients were calculated by the compiler.																															
AUXILIARY INFORMATION																															
METHOD/APPARATUS/PROCEDURE: A Van Slyke-Neill Manometric Apparatus manufactured by the Eimer and Amend Co. was used. The procedure of Van Slyke (1) for pure liquids was modified (2) so that small solvent samples (2 cm ³) could be used with almost complete recovery of the sample. An improved temperature control system was used.		SOURCE AND PURITY OF MATERIALS: Cyclohexene. B.p. (756.6 mmHg) t/°C 82.35 - 82.50 (corr.). Cyclohexane. B.p. (760.7 mmHg) t/°C 80.90 (corr.). Data on density, refractive index and vapor pressure are in the thesis.																													
SOURCE AND PURITY OF MATERIALS: (1) Methane. Prepared by hydrolysis of crystalline methyl Grignard reagent. Passed through conc. H ₂ SO ₄ , solid KOH, and Dririte. (2) Hydrocarbons. Both were Eastman Kodak Co. products. They were purified by standard methods, and distilled from Na in a nitrogen atm.		ESTIMATED ERROR: $\delta T/K = 0.05$																													
		REFERENCES: 1. Van Slyke, D. D. J. Biol. Chem. 1939, 130, 545. 2. Ijams, C. C. Ph.D. thesis, 1941 Vanderbilt University																													

COMPONENTS:		ORIGINAL MEASUREMENTS:
1. Methane; CH ₄ ; [74-82-8]		Cukor, P.M.; Prausnitz, J.M.;
2. 1,1'-Bicyclohexyl; C ₁₂ H ₂₂ ; [92-51-3]		<i>J. Phys. Chem.</i> <u>1972</u> , <i>76</i> , 598-601
VARIABLES:		PREPARED BY:
Temperature		C.L. Young
EXPERIMENTAL VALUES:		
T/K	Henry's Constant ^a /atm	Mole fraction of methane ^b in liquid, x_{CH_4}
300	298	0.00336
325	341	0.00293
350	378	0.00265
375	406	0.00246
400	422	0.00237
425	425	0.00235
450	415	0.00241
475	392	0.00255
a. Quoted in supplementary material for original paper		
b. Calculated by compiler for a partial pressure of 1 atmosphere.		
AUXILIARY INFORMATION		
METHOD/APPARATUS/PROCEDURE:		SOURCE AND PURITY OF MATERIALS:
Volumetric apparatus similar to that described by Dymond and Hildebrand (1). Pressure measured with a null detector and precision gauge. Details in ref. (2).		No details given
		ESTIMATED ERROR:
		$\delta T/K = \pm 0.05$; $\delta x_{CH_4} = \pm 2\%$
		REFERENCES:
		1. Dymond, J.; Hildebrand, J.H. <i>Ind. Eng. Chem. Fundam.</i> <u>1967</u> , <i>6</i> , 130.
		2. Cukor, P.M.; Prausnitz, J.M. <i>Ind. Eng. Chem. Fundam.</i> <u>1971</u> , <i>10</i> , 638.

<p>COMPONENTS:</p> <ol style="list-style-type: none"> 1. Methane; CH_4; [74-82-8] 2. Cyclohexane; C_6H_{12}; [110-82-7] 	<p>EVALUATOR:</p> <p>Colin L. Young Department of Physical Chemistry, University of Melbourne. Parkville, Victoria, 3052 Australia. February 1986.</p>
<p>CRITICAL EVALUATION:</p> <p>This system has been fairly extensively investigated by Russian workers but there are serious doubts as to the reliability of some of the early work, ref (1-3). Legret, Richon and Renon (4) classified the data of Stepanov and Vybornova (5) as having methane mole fractions of better than 2 per cent but the original article was unavailable to us. The most extensive study is that of Reamer et al. (6). Their data are thought to be fairly reliable and are classified as tentative. Since these workers did not, however, provide raw experimental data it is difficult to establish the reliability of the smoothed data with certainty. The earlier data of Sage et al. (7) are very limited in extent and are superseded by this groups later measurements (6).</p> <p>The recent data of Brunner et al. (8) are in reasonable agreement with the more extensive data of Sage et al. (6). The data of Schoch et al. (9) are only of moderate precision but are in reasonable agreement with the data of Reamer et al. (6). Therefore the data given in ref (8) and (9) support the classification of tentative for the data of Reamer et al. (6). However, in view of the fact that ref. (6) only reports smoothed data the data cannot be unreservedly classified as recommended.</p> <p>The data of Frolich et al. (10) were presented in small graphical form and are thought to be of low accuracy and are classified as doubtful.</p> <p>References.</p> <ol style="list-style-type: none"> 1. Savvina, Ya. D.; Velikovskii, A. S.; <i>Zh. Fiz. Khim.</i>, <u>1956</u>, 30, 1596. 2. Savvina, Ya. D.; <i>Tr. Vses. Nauch. Issled. Inst. Prirod. Gazov.</i>, <u>1962</u>, 17-25, 185. 3. Stepanov, G. S.; <i>Gazov. Delo.</i>, <u>1970</u>, 1, 26. 4. Legret, D.; Richon, D.; Renon, H.; <i>Fluid Phase Equilib.</i>, <u>1984</u>, 17, 323. 5. Stepanov, G. S.; Vybornova, Ya. I.; <i>Gazov. Delo. Nauch. Tekhn. Sb.</i>, <u>1964</u>, 10, 9. 6. Reamer, H. H.; Sage, B. H.; Lacey, W. N.; <i>Chem. Eng. Data Ser.</i> 3, <u>1958</u>, 3, 240. 7. Sage, B. H.; Webster, D. C.; Lacey, W. N.; <i>Ind. Eng. Chem.</i>, <u>1936</u>, 38, 1045. 8. Brunner, E.; Maier, S.; Windhaber, K.; <i>J. Phys. E.</i>, <u>1984</u>, 17, 44. 9. Schoch, E. P.; Hoffmann, A. E.; Mayfield, F. D.; <i>Ind. Eng. Chem.</i>, <u>1940</u>, 32, 1351. 10. Frolich, K.; Tauch, E. J.; Hogan, J. J.; Peer, A. A.; <i>Ind. Eng. Chem.</i>, <u>1931</u>, 23, 548. 	

COMPONENTS:		ORIGINAL MEASUREMENTS:	
1. Methane; CH ₄ ; [74-82-8]		Frolich, P.K.; Tauch, E.J.;	
2. Cyclohexane; C ₆ H ₁₂ ; [110-82-7]		Hogan, J.J.; Peer, A.A.	
		Ind. Eng. Chem. <u>1931</u> , 23, 548-550.	
VARIABLES:		PREPARED BY:	
Pressure		C.L. Young	
EXPERIMENTAL VALUES:			
T/K	P/MPa	Solubility *	Mole fraction of methane in liquid, ⁺ x_{CH_4}
298.15	1.0	6	0.026
	2.0	14	0.059
	3.0	23	0.093
	4.0	34	0.131
	5.0	44	0.164
	6.0	56	0.199
	7.0	68	0.232
* Data taken from graph in original article. Volume of gas measured at 101.325 kPa and 298.15 K dissolved by unit volume of liquid measured under the same conditions.			
+ Calculated by compiler.			
AUXILIARY INFORMATION			
METHOD/APPARATUS/PROCEDURE:		SOURCE AND PURITY OF MATERIALS:	
Static equilibrium cell. Liquid saturated with gas and after equilibrium established samples removed and analysed by volumetric method. Allowance was made for the vapor pressure of the liquid and the solubility of the gas at atmospheric pressure. Details in source.		Stated that the materials were the highest purity available. Purity 98 to 99 mole per cent.	
		ESTIMATED ERROR:	
		$\delta T/K = \pm 0.1$; $\delta x_{\text{CH}_4} = \pm 5\%$	
		REFERENCES:	

COMPONENTS:			ORIGINAL MEASUREMENTS:	
1. Methane; CH ₄ ; [74-82-8]			Sage, B. H.; Webster, D. C.;	
2. Cyclohexane; C ₆ H ₁₂ ; [110-82-7]			Lacey, W. N.	
			Ind. Eng. Chem.	
			<u>1936</u> , 28, 1045-1047.	
VARIABLES:			PREPARED BY:	
			C. L. Young	
EXPERIMENTAL VALUES:				
T/K (T/°F)	p/psi	P/MPa [†]	Mass fraction of methane	Mole fraction [†] of methane, x _{CH₄}
310.9 (100)	2045 2554	14.10 17.61	0.1001 0.1344	0.3683 0.4487
344.3 (160)	2196 2698	15.14 18.60	0.1001 0.1344	0.3683 0.4487
377.6 (220)	2240 2734	15.44 18.85	0.1001 0.1344	0.3683 0.4487
† calculated by compiler.				
AUXILIARY INFORMATION				
METHOD/APPARATUS/PROCEDURE:			SOURCE AND PURITY OF MATERIALS:	
PVT cell charged with mixture of known composition. Pressure measured with pressure balance. Bubble point determined from the discontinuity in the pressure, volume isotherm. Details of apparatus in ref. (1).			1. Prepared from natural gas, treated for removal of higher alkanes, carbon dioxide and water vapor. Final purity 99.9 mole per cent.	
			2. Eastman Kodak Co. sample, used without further purification.	
			ESTIMATED ERROR:	
			δT/K = ±0.1; δP/MPa = ±0.02;	
			δx _{CH₄} = ±0.002 (estimated by compiler).	
			REFERENCES:	
			1. Sage, B. H.; Lacey, W. N.	
			Ind. Eng. Chem.	
			<u>1934</u> , 26, 103.	

COMPONENTS:			ORIGINAL MEASUREMENTS:		
1. Methane; CH ₄ ; [74-82-8]			Schoch, E. P.; Hoffmann, A. E.;		
2. Cyclohexane; C ₆ H ₁₂ ; [110-82-7]			Mayfield, F. D.		
			Ind. Eng. Chem. <u>1940</u> , <u>32</u> , 1351-3.		
VARIABLES:			PREPARED BY:		
Temperature, pressure			C. L. Young		
EXPERIMENTAL VALUES:					
T/K	P/MPa	Mole fraction of methane in liquid, x_{CH_4}	T/K	P/MPa	Mole fraction of methane in liquid, x_{CH_4}
311.08	4.15	0.1185	344.26	17.35	0.4166
	7.708	0.2160		20.24	0.4812
	11.17	0.2996		23.81	0.5677
	14.81	0.3833		25.72	0.6358
	18.06	0.4561		26.83	0.6916
	20.49	0.5117		27.08	0.7385
	21.90	0.5447		26.92	0.7838
	23.44	0.5870	377.59	4.71	0.1189
	25.07	0.6330		8.756	0.2173
	25.83	0.6939		12.42	0.2998
	26.23	0.7414		16.20	0.3855
	26.32	0.7810		20.84	0.5000
344.26	4.47	0.1175		23.48	0.5784
	8.467	0.2165		25.06	0.6613
	10.49	0.2599		25.33	0.7175
	14.00	0.3423		25.28	0.7754
AUXILIARY INFORMATION					
METHOD/APPARATUS/PROCEDURE:			SOURCE AND PURITY OF MATERIALS:		
Rocking equilibrium cell fitted with stirring paddles. Temperature measured with Beckmann thermometer calibrated against standard platinum resistance thermometer. Pressure measured with Bourdon gauge. Samples injected into cell using mercury displacement. Equilibrium pressure measured. Bubble point determined from change in slope of pressure-volume isotherms. Details in ref. (1).			1. Crude sample treated for removal of oxygen, carbon dioxide, water vapor and liquids condensable at 200 K; distilled.		
			2. Eastman Kodak Co. sample distilled.		
			ESTIMATED ERROR:		
			$\delta T/K = \pm 0.01$ at 311.08 K; ± 0.03 at higher temperatures; $\delta P/MPa = \pm 0.01$; $\delta x_{CH_4} = \pm 0.001$ (estimated by compiler).		
			REFERENCES:		
			1. Schoch, E. P.; Hoffmann, A. E.;		
			Kasperik, A. S.; Lightfoot, J. H.		
			Mayfield, F. D.		
			Ind. Eng. Chem. <u>1940</u> , <u>32</u> , 788.		

COMPONENTS:			ORIGINAL MEASUREMENTS:	
1. Methane; CH ₄ ; [74-82-8]			Reamer, H. H.; Sage, B. H.;	
2. Cyclohexane; C ₆ H ₁₂ ; [110-82-7]			Lacey, W. N.	
			Ind. Eng. Chem.	
			1958, 3, 240-245.	
VARIABLES:			PREPARED BY:	
			C. L. Young	
EXPERIMENTAL VALUES:				
T/K (T/°F)	P/MPa	p/psi	Mole fraction of methane in liquid, x _{CH₄}	in vapor, y _{CH₄}
294.3 (70)	1.38	200	0.0440	0.9891
	2.76	400	0.0870	0.9924
	4.14	600	0.1288	0.9934
	5.52	800	0.1693	0.9938
	6.89	1000	0.2086	0.9938
	8.62	1250	0.2560	0.9931
	10.34	1500	0.3022	0.9920
	12.07	1750	0.3468	0.9901
	13.79	2000	0.3901	0.9873
	15.51	2250	0.4331	0.9844
	17.24	2500	0.4750	0.9805
	18.96	2750	0.5170	0.9740
	20.68	3000	0.5581	0.9661
	24.13	3500	0.6392	0.9390
310.9 (100)	27.58	4000	0.7350	0.8489
	28.20	4090	0.765	0.765
	1.38	200	0.0414	0.9793
	2.76	400	0.0920	0.9860
	4.14	600	0.1217	0.9876
	5.52	800	0.1601	0.9883
	6.89	1000	0.1977	0.9885
	8.62	1250	0.2430	0.9876
(cont.)				
AUXILIARY INFORMATION				
METHOD/APPARATUS/PROCEDURE:			SOURCE AND PURITY OF MATERIALS:	
PVT cell charged with mixture of known composition. Pressure measured with pressure balance. Temperature measured using platinum resistance thermometer. Details in ref. (1). Gas samples analysed by condensing cyclohexane out in cold trap. Bubble point determined from discontinuity in pressure-volume isotherm for fixed total composition.			1. Sample treated for removal of carbon dioxide and water vapor. Purity about 99.9 mole per cent.	
			2. Phillips Petroleum Co. research grade sample, purity 99.98 mole per cent.	
			ESTIMATED ERROR:	
			δT/K = ±0.05; δP/MPa = ±0.01;	
			δx _{CH₄} , δy _{CH₄} = ±0.002.	
			REFERENCES:	
			1. Sage, B. H.; Lacey, W. N.	
			Trans. Am. Inst. Mining Met. Engrs	
			1940, 136, 136.	

COMPONENTS:		ORIGINAL MEASUREMENTS:		
1. Methane; CH ₄ ; [74-82-8]		Reamer, H. H.; Sage, B. H.; Lacey, W. N.		
2. Cyclohexane; C ₆ H ₁₂ ; [110-82-7]		Ind. Eng. Chem. 1958, 3, 240-245.		
EXPERIMENTAL VALUES:				
T/K (T/°F)	P/MPa	p/psi	Mole fraction of methane in liquid, x _{CH₄}	in vapor, y _{CH₄}
310.9 (100)	10.34	1500	0.2870	0.9860
	12.07	1750	0.3300	0.9840
	13.79	2000	0.3720	0.9810
	15.51	2250	0.4129	0.9770
	17.24	2500	0.4540	0.9710
	18.96	2750	0.4959	0.9640
	20.68	3000	0.5365	0.9539
	24.13	3500	0.6201	0.9270
	27.58	4000	0.7274	0.8263
	27.85	4040	0.758	0.758
344.3 (160)	1.38	200	0.0365	0.9380
	2.76	400	0.0740	0.9616
	4.14	600	0.1103	0.9671
	5.52	800	0.1462	0.9700
	6.89	1000	0.1812	0.9709
	8.62	1250	0.2244	0.9712
	10.34	1500	0.2670	0.9700
	12.07	1750	0.3086	0.9678
	13.79	2000	0.3505	0.9649
	15.51	2250	0.3911	0.9598
	17.24	2500	0.4323	0.9540
	18.96	2750	0.4746	0.9459
	20.68	3000	0.5180	0.9370
	24.13	3500	0.6070	0.9002
	26.75	3880	0.737	0.737
377.6 (220)	1.38	200	0.0318	0.8437
	2.76	400	0.0677	0.9065
	4.14	600	0.1028	0.9249
	5.52	800	0.1373	0.9334
	6.89	1000	0.1714	0.9381
	8.62	1250	0.2134	0.9417
	10.34	1500	0.2548	0.9410
	12.07	1750	0.2963	0.9399
	13.79	2000	0.3374	0.9370
	15.51	2250	0.3780	0.9310
	17.24	2500	0.4191	0.9220
	18.96	2750	0.4610	0.9109
	20.68	3000	0.5079	0.8960
	24.13	3500	0.6090	0.8270
	25.44	3690	0.711	0.711
410.9 (280)	1.38	200	0.0248	0.6520
	2.76	400	0.0603	0.7990
	4.14	600	0.0951	0.8464
	5.52	800	0.1295	0.8709
	6.89	1000	0.1634	0.8853
	8.62	1250	0.2054	0.8939
	10.34	1500	0.2471	0.8967
	12.07	1750	0.2886	0.8961
	13.79	2000	0.3297	0.8918
	15.51	2250	0.3708	0.8829
	17.24	2500	0.4134	0.8690
	18.96	2750	0.4615	0.8501
	20.68	3000	0.5141	0.8210
	23.10	3350	0.667	0.667

(cont.)

(cont.)

COMPONENTS:

1. Methane; CH_4 ; [74-82-8]
2. Cyclohexane; C_6H_{12} ; [110-82-7]

ORIGINAL MEASUREMENTS:

Reamer, H. H.; Sage, B. H.;
 Lacey, W. N.
Ind. Eng. Chem.
1958, 3, 240-245.

EXPERIMENTAL VALUES:

T/K (T/°F)	P/MPa	p/psi	Mole fraction of methane	
			in liquid, x_{CH_4}	in vapor, y_{CH_4}
444.3 (340)	1.38	200	0.0148	0.3653
	2.76	400	0.0512	0.6354
	4.14	600	0.0870	0.7236
	5.52	800	0.1224	0.7673
	6.89	1000	0.1566	0.7891
	8.62	1250	0.1984	0.8019
	10.34	1500	0.2392	0.8059
	12.07	1750	0.2820	0.8079
	13.79	2000	0.3250	0.8031
	15.51	2250	0.3697	0.7886
	17.24	2500	0.4193	0.7644
	18.96	2750	0.4781	0.7000
	20.06	2910	0.608	0.608

COMPONENTS:	ORIGINAL MEASUREMENTS:				
1. Methane; CH ₄ ; [74-82-8] 2. Cyclohexane; C ₆ H ₁₂ ; [110-82-7]	Savvina, Ya. D. Tr. Vses. Nauchno-Issled. Inst. Prirodn. Gazov., 1962, 17/25, 185-196.				
VARIABLES:	PREPARED BY:				
Temperature, pressure	C. L. Young				
EXPERIMENTAL VALUES:					
T/K (t/°C)	P/kgcm ⁻³	P/Mpa	K-value methane cyclohexane		
313.2 (40)	20	1.96	15.85	0.052	
	50	4.90	6.59	0.021	
	100	9.81	3.33	0.028	
	150	14.7	2.36	0.040	
	200	19.6	1.83	0.065	
	220	21.6	1.69	0.081	
	250	24.5	1.42	0.180	
	265	26.0	1.22	0.413	
	269	26.4	1.10	0.651	
333.2 (60)	20	1.96	16.10	0.070	
	50	4.90	6.90	0.030	
	100	9.81	3.45	0.037	
	150	14.7	2.43	0.053	
	200	19.6	1.85	0.084	
	230	22.6	1.61	0.134	
	250	24.5	1.43	0.214	
	263	25.8	1.20	0.452	
	266	26.1	1.10	0.662	
353.2 (80)	50	4.90	7.11	0.038	
	100	9.81	3.61	0.043	
	150	14.7	2.45	0.064	
	200	19.6	1.87	0.110	
	220	21.6	1.70	0.156	
	240	23.5	1.47	0.227	
	250	24.5	1.34	0.327	
AUXILIARY INFORMATION					
METHOD APPARATUS/PROCEDURE:		SOURCE AND PURITY OF MATERIALS:			
Values appear to be determined using apparatus described in ref.1.		No Details given.			
		ESTIMATED ERROR:			
		REFERENCES:			
		1. Savvina, Ya. D.; Velikovskii, A. S. Tr. Vses. Nauchno-Issled. Inst. Prirodn. Gazov., 1962, 17/25, 163.			

COMPONENTS:

1. Methane; CH_4 ; [74-82-8]
2. Cyclohexane; C_6H_{12} ; [110-82-7]

ORIGINAL MEASUREMENTS:

Savvina, Ya. D.
Tr. Vses. Nauchno-Issled. Inst. Prirodn. Gazov., 1962, 17/25, 185-196.

Experimental Values:

T/K (t/°C)	P/kgcm ⁻³	P/Mpa	K-value	
			methane	cyclohexane
353.2(80) 373.2 (100)	262	26.0	1.07	0.765
	30	2.94	11.50	0.086
	50	4.90	7.61	0.048
	100	9.81	3.69	0.052
	150	14.7	2.51	0.081
	200	19.6	1.88	0.134
	220	21.6	1.63	0.177
	240	23.5	1.39	0.306
	250	24.5	1.21	0.498
	254	24.9	1.03	0.875
393.2 (120)	20	1.96	17.87	0.167
	50	4.90	7.61	0.073
	100	9.81	3.78	0.077
	150	14.7	2.44	0.108
	200	19.6	1.81	0.186
	220	21.6	1.57	0.254
	240	23.5	1.25	0.473
	246	24.1	1.04	0.863
	30	2.94	12.93	0.170
	50	4.90	7.20	0.097
423.2 (150)	100	9.81	3.56	0.107
	150	14.7	2.31	0.143
	200	19.6	1.65	0.279
	220	21.6	1.33	0.458
	227	22.3	1.09	0.788

COMPONENTS:		ORIGINAL MEASUREMENTS:		
(1) Methane; CH ₄ ; [74-82-8]		Brunner, E.; Maier, S.; Windhaber, K.		
(2) Cyclohexane; C ₆ H ₁₂ ; [110-82-7]		J. Phys. E: <u>1984</u> . 17, 44-8.		
VARIABLES:		PREPARED BY:		
T/K = 311.0, 344.3 p _t /MPa = 3.05 -18.32		H. L. Clever		
EXPERIMENTAL VALUES:				
Temperature		Total Pressure	Mol Fraction	Molar Volume
t/°C	T/K	p _t /MPa	x ₁	v /cm ³ mol ⁻¹
37.8	311.0	0.0214	0	110.5
		5.04	0.1465	102.5
		10.95	0.3041	93.1
		13.48	0.3651	89.8
		16.15	0.4289	87.0
71.1	344.3	0.0737	0	115.4
		3.05	0.0814	111.4
		5.94	0.1597	106.9
		8.95	0.2357	102.5
		11.77	0.3023	97.8
		15.57	0.3929	93.5
		18.32	0.4555	89.9
The Kelvin temperatures were added by the compiler.				
The first line at each temperature gives the vapor pressure and molar volume of pure cyclohexane.				
AUXILIARY INFORMATION				
METHOD/APPARATUS/PROCEDURE:		SOURCE AND PURITY OF MATERIALS:		
The measuring method consists in metering known masses of components 1 and 2 into the measuring cell with continuous thorough stirring until a transition from the homogeneous to the heterogeneous state, or <i>vice versa</i> , is observed.		(1) Methane. Messer-Griesheim. Purity stated to be 99.9 percent.		
The measuring cell is one of three specially constructed cells described in the paper.		(2) Cyclohexane. BASF. Stated to be 99.99 percent purity.		
From the masses metered in and the temperature-corrected cell volume, the boiling point or the dew point as well as the densities are obtained.		ESTIMATED ERROR:		
The p _v T data of Angus <i>et al.</i> (ref 1) was used. The average deviation of the experimental bubble points and molar volumes from the smoothed values obtained by Reamer <i>et al.</i> (ref 2) is less than 0.5 percent.		δT/K = ± 0.1		
		δp/p = ± 0.002		
		δx ₁ /x ₁ = ± 0.02		
		δv/v = ± 0.02		
		REFERENCES:		
		1. Angus, S.; Armstrong, B.; de Reuck Methane. <i>Int. thermo tables of the fluid state-5</i> <u>1978</u> , Pergamon.		
		2. Reamer, H.H.; Sage, B.H.; Lacey, W.N. J. Chem. Eng. Data <u>1958</u> , 3, 240.		

COMPONENTS:				ORIGINAL MEASUREMENTS:					
1. Methane; CH ₄ ; [74-82-8] 2. Hexane; C ₆ H ₁₄ ; [110-54-3] 3. Cyclohexane; C ₆ H ₁₂ ; [110-82-7]				Velikovskii, V. S. ; Stepanova, G. S Vybornova, Ya. I. <i>Gazov. Prom.</i> , <u>1965</u> , 10(6), 45-49.					
VARIABLES: Temperature, pressure				PREPARED BY: C. L. Young					
EXPERIMENTAL VALUES:									
T/K	p /kg cm	p /MPa	in liquid		Mole fractions in vapor				
273.15	50	4.9	0.230	0.560	0.210	0.9969	0.0025	0.0006	
	50	4.9	0.220	0.347	0.433	0.9976	0.0014	0.0010	
	50	4.9	0.205	0.165	0.630	0.9982	0.0006	0.0012	
	100	9.8	0.415	0.430	0.155	0.9935	0.0050	0.0015	
	100	9.8	0.395	0.270	0.335	0.9945	0.0027	0.0028	
	100	9.8	0.360	0.130	0.510	0.9955	0.0010	0.0035	
	150	14.7	0.595	0.290	0.115	0.9815	0.0140	0.0045	
	150	14.7	0.550	0.200	0.250	0.9830	0.0080	0.0090	
	150	14.7	0.500	0.100	0.400	0.9840	0.0035	0.0125	
	200	19.6	0.775	0.155	0.070	0.9260	0.0540	0.0200	
	200	19.6	0.709	0.125	0.166	0.9460	0.0260	0.0280	
	200	19.6	0.632	0.068	0.300	0.9600	0.0080	0.0320	
	210	20.6	0.860	0.100	0.040	0.8600	0.1000	0.0400	
	230	22.6	0.855	0.065	0.080	0.8550	0.0650	0.0800	
	250	24.5	0.800	0.045	0.155	0.8950	0.0250	0.0830	
	255	25.0	0.849	0.033	0.118	0.8490	0.0330	0.1180	
	293.15	50	4.9	0.203	0.573	0.324	0.9870	0.0080	0.0022
		50	4.9	0.190	0.355	0.455	0.9900	0.0055	0.0045
50		4.9	0.170	0.175	0.655	0.9920	0.0027	0.0053	
100		9.8	0.382	0.444	0.174	0.9850	0.0120	0.0030	
100		9.8	0.358	0.280	0.362	0.9870	0.0070	0.0060	
100		9.8	0.325	0.130	0.545	0.9890	0.0030	0.0080	
150		14.7	0.545	0.310	0.145	0.9750	0.0190	0.0060	
150		14.7	0.510	0.213	0.277	0.9780	0.0110	0.0110	
AUXILIARY INFORMATION									
METHOD APPARATUS/PROCEDURE: Details of method given in ref. (1).				SOURCE AND PURITY OF MATERIALS: 1. Purity 98.5 mole per cent, 1.5 mole per cent nitrogen. 2. and 3. Purity checked by refractive index, density and boiling point.					
				ESTIMATED ERROR:					
				REFERENCES: 1. Velikovskii, A. S.; Pokrovskii, V. K.; Stepanova, G. S.; Rasamot, M. S. <i>Gazov. Prom.</i> , <u>1958</u> no. 10.					

1. Methane; CH_4 ; [74-82-8]
2. Hexane; C_6H_{14} ; [110-54-3]
3. Cyclohexane; C_6H_{12} ; [110-82-7]

Velikovskii, V. S.; Stepanova, G. S.
 Vybornova, Ya. I.
Gazov. Prom., **1965**, *10*(6), 45-49.

T/K	p		in liquid		Mole fractions			
	/kg cm	/MPa			in vapor			
293.15	150	14.7	0.460	0.105	0.435	0.9800	0.0050	0.0150
	200	19.6	0.720	0.200	0.080	0.9380	0.0460	0.0160
	200	19.6	0.662	0.142	0.196	0.9540	0.0220	0.0240
	200	19.6	0.590	0.080	0.330	0.9570	0.0100	0.0330
	221	21.7	0.845	0.115	0.040	0.8450	0.1150	0.0400
	238	23.3	0.837	0.072	0.091	0.8370	0.0720	0.0910
	250	24.5	0.740	0.050	0.210	0.9030	0.0190	0.0780
	262	25.7	0.828	0.038	0.134	0.828	0.0380	0.1340
313.15	50	4.9	0.192	0.585	0.223	0.9800	0.0160	0.0040
	50	4.9	0.180	0.360	0.460	0.9830	0.0095	0.0075
	50	4.9	0.165	0.180	0.655	0.9855	0.0045	0.0100
	100	9.8	0.360	0.460	0.180	0.9770	0.0180	0.0050
	100	9.8	0.332	0.290	0.378	0.9790	0.0110	0.0100
	100	9.8	0.300	0.150	0.540	0.9810	0.0050	0.0140
	150	14.7	0.510	0.348	0.142	0.9645	0.0270	0.0085
	150	14.7	0.475	0.225	0.300	0.9660	0.0170	0.0170
	150	14.7	0.435	0.125	0.440	0.9710	0.0080	0.0210
	200	19.6	0.665	0.240	0.095	0.9300	0.0520	0.0180
	200	19.6	0.620	0.160	0.220	0.9450	0.0260	0.0290
	200	19.6	0.567	0.090	0.343	0.9520	0.0120	0.0360
	225	22.1	0.827	0.126	0.047	0.8270	0.1260	0.047
	230	22.6	0.650	0.072	0.278	0.9270	0.0160	0.0570
	241	23.6	0.815	0.082	0.103	0.8150	0.0820	0.1030
	262	25.7	0.809	0.042	0.1490	0.8090	0.0420	0.1490
333.15	50	4.9	0.179	0.592	0.228	0.9660	0.0265	0.0075
	50	4.9	0.160	0.366	0.474	0.9690	0.0160	0.0150
	50	4.9	0.141	0.190	0.669	0.9720	0.0080	0.0200
	100	9.8	0.338	0.476	0.191	0.9635	0.0280	0.0085
	100	9.8	0.306	0.302	0.392	0.9660	0.0170	0.0170
	100	9.8	0.277	0.165	0.558	0.9695	0.0085	0.0220
	150	14.7	0.480	0.365	0.155	0.9520	0.0360	0.0120
	150	14.7	0.449	0.235	0.316	0.9560	0.0220	0.0220
	150	14.7	0.415	0.133	0.452	0.9600	0.0110	0.0290
	200	19.6	0.645	0.250	0.110	0.9160	0.0610	0.0230
	200	19.6	0.591	0.173	0.236	0.9260	0.0360	0.0380
	200	19.6	0.545	0.100	0.355	0.9360	0.160	0.0480
	210	20.6	0.685	0.220	0.095	0.8970	0.0750	0.0280
	210	20.6	0.626	0.157	0.217	0.9170	0.0400	0.0430
	210	20.6	0.572	0.095	0.333	0.9250	0.0200	0.0550
	223	21.9	0.805	0.140	0.055	0.8050	0.1400	0.0550
	239	23.4	0.800	0.089	0.111	0.8000	0.0890	0.1110
	259	25.4	0.795	0.045	0.160	0.7950	0.0450	0.1600